

# Urinary System

## Course

*Principles of Health Science*

## Unit XVII

*Anatomy & Physiology*

## Essential Question

*What are the tissues and systems of the human body?*

## TEKS

*130.202 (c) 1D, 1E, 1G, 9B*

## Prior Student Learning

*n/a*

## Estimated time

*1-2 hours*

## Rationale

To pursue a career in health care, proficiency in anatomy and physiology is vital.

## Objectives

Upon completion of this lesson, the student will be able to:

- identify terms pertaining to the urinary system;
- list the parts of the urinary system and the functions of each;
- discuss the general functions of the urinary system;
- give four steps in the formation of urine;
- identify diseases and disorders of the urinary system;
- discuss dialysis and transplants; and
- label the diagram of the urinary system.

## Engage

Homeostasis of water and electrolytes in body fluids relies on proper functioning of the urinary system. Why do you think any disease or disorder that reduces the effectiveness of the kidneys would be life threatening?

## Key Points

- I. Identification of terms
  - A. Albumin – a protein found in blood – may be present in urine in some disease conditions
  - B. Catheter – a tube for removing fluids from or injecting fluids into a body cavity – as the urinary bladder
  - C. Cystoscope – instrument used for interior examination of urinary bladder or ureters
  - D. Dialysis – diffusion of dissolved substance through a semipermeable membrane
  - E. Enuresis – involuntary bed-wetting in children over three years of age
  - F. Excretion – the elimination of waste products from the body
  - G. Micturition – urination
  - H. Urea – chief nitrogenous constituent of urine – an end product of protein metabolism
- II. Parts of the urinary system
  - A. Kidneys – pair of bean-shaped organs located on the posterior abdominal wall behind the peritoneum at about the level of the first lumbar vertebra contains little filter's called nephrons
  - B. Ureters – tubes extending from the kidneys to the urinary bladder

- C. Urinary bladder – muscularly bag in which urine collects
  - D. Urethra – tube passing from urinary bladder to exterior of the body
- III. Functions of the urinary system
- A. Maintains homeostasis by regulating the composition and volume of the blood by removing and restoring selected amounts of water and solutes
  - B. Maintains blood pressure by influencing plasma volume of the blood
  - C. Helps in metabolic processes
    - 1. gluconeogenesis during times of starvation
    - 2. secretes erythropoietin which stimulates the production of red blood cells
    - 3. participates in the synthesis of calcitriol (the active form of vitamin D)
- IV. Formation of urine
- A. Blood flows to kidney by means of renal artery
  - B. Waste products such as urea, creatinine, uric acid, and various salts are filtered from the blood by structures within the kidney
  - C. The waste is called urine and flows from the kidney by means of the ureter to the urinary bladder
  - D. The filtered blood returns to the circulating blood
- V. Disorders of the urinary system
- A. Anuria – complete urinary suppression or failure of kidney function
  - B. Cystitis – inflammation of the bladder usually occurring secondary to ascending urinary tract infections
  - C. Diabetes Insipidus – polyuria and polydipsia caused by inadequate secretion of vasopressin (ADH) by the posterior pituitary gland (Neurohypophysis)
  - D. Dysuria – painful urination
  - E. Edema – condition in which body tissues contain an excessive amount of tissue fluid
  - F. Glycosuria – presence of glucose in the urine
  - G. Incontinence – inability to retain urine
  - H. Kidney stone – calculus or crystalline masses present in the pelvis of the kidney composed primarily of urates, oxalates, phosphates, and carbonates of varying size
  - I. Nephritis – severe inflammation of the kidney
  - J. Oliguria – diminished amount of urine formed
  - K. Polyuria – excessive secretion and discharge of urine
  - L. Renal failure – failure of the kidneys to perform their essential functions. Usually less than 10% of total kidney function
  - M. Uremia – condition in which wastes normally excreted by the kidney are retained in the blood
  - N. Urethritis – inflammation of the urethra

- O. Urinary tract infections – of the urinary tract (kidneys, ureters, bladder, urethra) by microorganisms
- VI. Dialysis and transplants
  - A. Dialysis – treatment for patients who have defective kidney function. The blood is cleansed by passing it through an artificial filter instead of the kidney
  - B. Kidney transplant – replacement of a diseased kidney with a healthy kidney provided by a donor

### **Activity**

- I. Draw and label the Urinary System. See Activity Sheet.
- II. Participate in the kidney song

### **Assessment**

Successful completions of the Draw the Urinary System.  
Successful completion of the Urinary System Quiz.

### **Materials**

Draw the Urinary System Activity  
Crayons  
Colored pencils  
Human Urinary System Diagram  
Urinary System Quiz - Key

<http://www.bioedonline.org/>

Utah State Office of Education, (2005). *Medical Anatomy and Physiology Teacher Resource CD*. Utah.

### **Accommodations for Learning Differences**

For reinforcement, students will make flashcards of the anatomical parts of the urinary system with their corresponding function.

For enrichment, students will research and report on a urinary system disease.

### **National and State Education Standards**

National Health Science Cluster Standards

HLC01.01 Academic Foundations

Health care workers will know the academic subject matter required (in addition to state high school graduation requirements) for proficiency within their area. They will use this knowledge as needed in their role.

HLC10.01 Technical Skills

Health Care Workers will apply technical skills required for all career specialties. They will demonstrate skills and knowledge as appropriate.

## TEKS

130.202 (c)(1)(D) organize, compile, and write ideas into reports and summaries;

130.202 (c)(1)(E) plan and prepare effective oral presentations; and

130.202 (c)(1)(G) describe biological and chemical processes that maintain homeostasis.

130.202 (c)(9)(B) identify wellness strategies for the prevention of disease.

## Texas College and Career Readiness Standards

### English Language Arts

II. B. Understand new vocabulary and concepts and use them accurately in reading writing and speaking.

III. B. Develop effective speaking styles for both group and one on one situations.

IV. A. Apply listening skills as an individual and as a member of a group in a variety of settings.

IV. B. 2. Listen actively and effectively in one-on-one communication situations.

### Science

1.E.1. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

1.E.2. Use essential vocabulary of the discipline being studied.

3.A.1. Use correct applications of writing practices in scientific communication.

## KIDNEYS, KIDNEYS

Kidneys, kidneys, filter my body, do  
Take the waste away from my bloodstream, too.  
I want you at "function normal"  
Less than that could be so harmful.  
So don't give up, or toxins build up  
And my body goes down the tube.

Kidneys, kidneys, help my blood pressure, do  
Keep it within normal limits for you.  
B/P that's too high is constricting  
And kidney damage inflicting  
And the R-A-A ---system should stay  
Ever working from day to day.

Kidneys, kidneys, please keep on working, do  
Renal failure causes its problems, true.  
Dialysis can clean blood for me  
While I wait for a donor kidney....  
And watch what I eat, renal diets aren't so neat  
So let's keep renal function complete.

Words by Renae Schumann to the tune of "Daisy, Daisy" 1992

## Draw the Urinary System

Draw the following structures associated with the urinary system. Color and label appropriately. Include the following:

Kidneys  
urinary bladder  
Ureters  
urethra

("Medical anatomy and," 2005)

## Urinary System Quiz

1. Identify three functions of the urinary system:

- 1.
- 2.
- 3.

2. Identify the four major structures of the urinary system and state their primary function:

- 1.
- 2.
- 3.
- 4.

3. Match the diseases and abnormalities commonly associated with the urinary system with the most appropriate description:

- |                             |                       |                  |
|-----------------------------|-----------------------|------------------|
| A. Incontinence             | B. Diabetes Insipidus | C. Edema         |
| D. Urinary Tract Infections | E. Cystitis           | F. Renal Failure |
| G. Nephritis                | H. Dysuria            | I. Kidney Stones |

- \_\_\_\_\_ 1. inflammation of the bladder usually occurring secondary to ascending urinary tract infections.
- \_\_\_\_\_ 2. polyuria and polydipsia caused by inadequate secretion of vasopressin (ADH) by the posterior pituitary gland (Neurohypophysis).
- \_\_\_\_\_ 3. condition in which body tissues contain an excessive amount of tissue fluid.
- \_\_\_\_\_ 4. the inability to retain urine.
- \_\_\_\_\_ 5. calculus or crystalline masses present in the pelvis of the kidney composed primarily of urates, oxalates, phosphates, and carbonates of varying size.
- \_\_\_\_\_ 6. inflammation of the kidney.
- \_\_\_\_\_ 7. failure of the kidneys to perform their essential functions. Usually less than 10% of total kidney function.
- \_\_\_\_\_ 8. painful urination.
- \_\_\_\_\_ 9. infection of the urinary tract (kidneys, ureters, bladder, urethra) by microorganisms.

("Medical anatomy and," 2005)

## Urinary System Quiz - Key

1. Identify three functions of the urinary system:

- 1. Maintains homeostasis by regulating the composition and volume of the blood by removing and restoring selected amounts of water and solutes**
- 2. Maintains blood pressure by influencing plasma volume of the blood**
- 3. Helps in metabolic processes**
  - a. gluconeogenesis during times of starvation**
  - b. secretes erythropoietin which stimulates the production of red blood cells**
  - c. participates in the synthesis of calcitriol (the active form of vitamin D)**

2. Identify the four major structures of the urinary system and state their primary function:

- 1. Kidneys - filters the blood and produces urine**
- 2. Ureters - transports urine to the bladder for storage**
- 3. Bladder - storage site of urine**
- 4. Urethra - passageway for urine from the bladder to the exterior of the body**

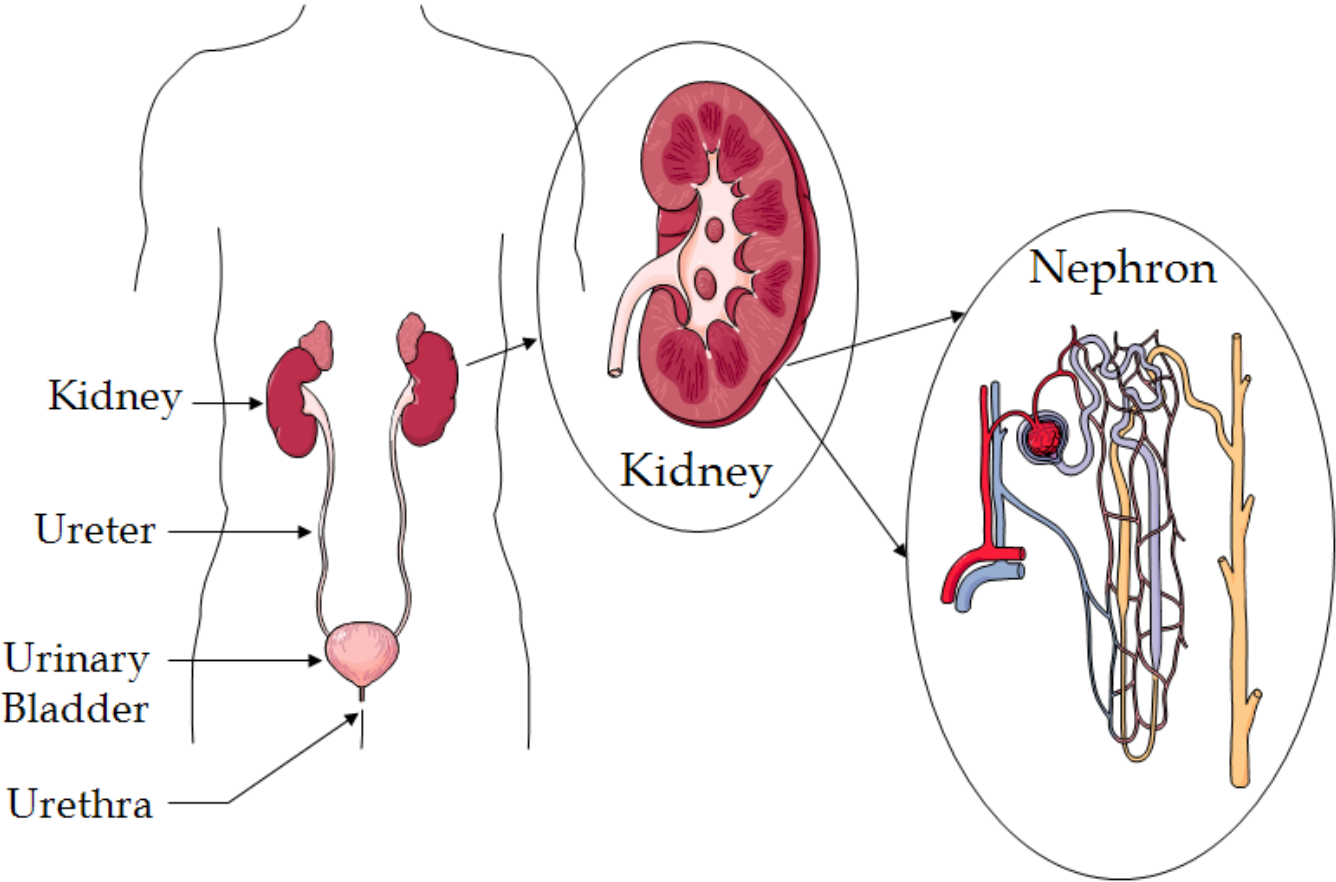
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- E** 1. inflammation of the bladder usually occurring secondary to ascending urinary tract infections.
- B** 2. polyuria and polydipsia caused by inadequate secretion of vasopressin (ADH) by the posterior pituitary gland (Neurohypophysis).
- C** 3. condition in which body tissues contain an excessive amount of tissue fluid
- A** 4. the inability to retain urine..
- I** 5. calculus or crystalline masses present in the pelvis of the kidney composed primarily of urates, oxalates, phosphates, and carbonates of varying size.
- G** 6. inflammation of the kidney.
- F** 7. failure of the kidneys to perform their essential functions. Usually less than 10% of total kidney function.
- H** 8. painful urination.
- D** 9. infection of the urinary tract (kidneys, ureters, bladder, urethra) by microorganisms.

("Medical anatomy and," 2005)

# Human Urinary System



BioEd Online